

CLAIMS

What is claimed is:

- 1 1. A method comprising:
2 placing incomplete chip package into a mold, the incomplete chip package
3 comprising a chip and a substrate electrically coupled using a flip chip
4 process, the chip having (i) a top surface facing the substrate, (ii) a bottom
5 surface opposite the top surface, and (iii) one or more side surfaces
6 between the top and bottom surfaces;
7 injecting a liquid resin into mold, the resin encapsulating a significant portion of
8 the one or more side surfaces, and filling a first gap between the top
9 surface and the adjacent substrate; and
10 curing the resin.
- 1 2. The method of claim 1, wherein the chip and substrate were electrically coupled
2 by a plurality of reflowed solder bumps.
- 1 3. The method of claim 1, wherein the incomplete chip package further comprises at
2 least one passive component electrically coupled to the substrate.
- 1 4. The method of claim 1, wherein the resin comprises an epoxy.
- 1 5. The method of claim 4, wherein the resin further comprises a filler material.
- 1 6. The method of claim 5, wherein the filler material comprises silica spheres.
- 1 7. The method of claim 1, wherein the resin is injected under pressure.

- 1 8. The method of claim 1, wherein the resin encapsulates substantially all of the one
2 or more side surfaces.
- 1 9. The method of claim 8, wherein the resin does not encapsulate the bottom surface.
- 1 10. The method of claim 1, wherein the mold comprises an upper mold cavity
2 surface, and the bottom surface butts directly up against an adjacent portion of the
3 upper mold cavity surface.
- 1 11. The method of claim 10, wherein a release film intervenes between the bottom
2 surface and the upper mold cavity surface.
- 1 12. The method of claim 1, wherein the mold is maintained at an elevated temperature
2 during said operation of injecting a liquid resin into the mold.
- 1 13. The method of claim 1, wherein the resin is cured by maintaining the resin at an
2 elevated temperature for at least a predetermined period of time.
- 1 14. The method of claim 1, wherein the substrate is a thin substrate.
- 1 15. The method of claim 1, wherein the substrate is comprised of a polymeric
2 material.
- 1 16. The method of claim 14, wherein the thin substrate is approximately 0.05mm to
2 0.5mm thick.
- 1 17. The method of claim 3, wherein said injecting a liquid resin into the mold also
2 fills at a second gap between a first surface of the at least one passive component
3 and an adjacent surface of the substrate.

1 18. The method of claim 3, wherein said injecting a liquid resin into the mold fully
2 encapsulates the at least one passive component.

1 19. A flip chip package made according to the process of claim 1.

1 20. A method comprising:

2 placing an incomplete flip chip package into a bottom inner cavity of a bottom
3 mold portion,
4 the incomplete flip chip package comprising a chip and a substrate, the
5 chip having a top surface coupled by reflowed solder bumps to a
6 upper surface of the substrate, the chip further comprising a bottom
7 surface opposite the top surface and one or more side surfaces
8 between the top and bottom surfaces;
9 mating an upper mold portion with the lower mold portion, the upper mold
10 portion having an upper inner cavity, the upper and bottom inner cavities
11 forming a mold inner cavity enclosing the incomplete flip chip package;
12 injecting a predetermined amount of a liquid resin into the mold inner cavity, the
13 liquid resin encapsulating the substantially all of the one or more side
14 surfaces and substantially all of the upper surface, the liquid resin further
15 filling a gap between the top surface of the chip and an adjacent portion of
16 the upper surface, encapsulating the reflowed solder bumps;
17 curing the liquid resin by maintaining the mold at an elevated temperature for a
18 predetermined period of time, the elevated temperature being equal to or
19 greater than the cure temperature of the filled liquid resin for the
20 predetermined period of time.

- 1 21. The method of claim 20, wherein the liquid resin comprises an epoxy and a silica
2 filler.
- 1 22. The method of claim 20, wherein the substrate is a thin substrate having an
2 approximate thickness of 0.05mm to 0.5mm.
- 1 23. The method of claim 20 further comprising:
2 removing the complete flip chip package from the mold inner cavity by separating
3 the upper and bottom mold portions, the complete flip chip package
4 comprising the incomplete flip chip package and the solidified filled resin
5 adhesively bonded to the incomplete flip chip package.
- 1 24. A flip chip package produced using the process of claim 20.
- 1 25. The method of claim 20, wherein the bottom surface butts against an adjacent
2 surface of the upper inner cavity.
- 1 26. The method of claim 25, wherein a release film intervenes between the bottom
2 surface and the adjacent surface of the upper inner cavity.
- 1 27. A flip chip package comprising:
2 a chip, the chip comprising a top surface, a bottom surface and one or more side
3 surfaces deposited between the top and bottom surfaces;
4 a substrate, the substrate comprising an upper surface;
5 a plurality of reflowed solder bumps, the reflowed solder bumps electrically
6 coupling the top surface with an adjacent portion of the upper surface; and

7 a monolithic element comprising solidified resin, the monolithic element
8 encapsulating and adhesively bonded to (i) substantially all of the one or
9 more side surfaces, (ii) a substantial portion of the upper surface, and (iii)
10 the plurality of reflowed solder bumps located in a gap between the top
11 surface and the upper surface.

1 28. The flip chip package of claim 27, wherein the solidified resin does not
2 encapsulate the bottom surface.

1 29. The flip chip package of the claim 27, wherein the solidified resin comprises an
2 epoxy.

1 30. The flip chip package of claim 27, wherein the substrate is a thin substrate.